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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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ST. ONGE STEWARD JOHNSTON & REENS, LLC
986 BEDFORD STREET
STAMFORD, CT 06905-5619

EXAMINER	
OLSEN, KAJ K	

ART UNIT	PAPER NUMBER
1753	

DATE MAILED: 08/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/029,659	PROHASKA ET AL.	
	Examiner	Art Unit	
	Kaj K. Olsen	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *20,21 and 23-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *20,21 and 23-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 20, 21 and 23-32 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 20, 21 and 23-32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claims 20 and 31 have been amended to specify that the ionomer membrane is without moisture and "has been without moisture since inception". This new limitation is neither supported by the original specification nor is it clear what the metes and bounds of this new limitation are (hence the rejection over both 112 first and second paragaraphs). First, there is no support in the specification for this new limitation. The specification deals with how the membrane is dry during the manufacture of the electrochemical cell (i.e. the membrane is purchased in a dry sheet and is kept in a dry form during the sensor construction). See

paragraphs 0009 and 0010. This new limitation however would presumably cover the membrane during the entire period of its existence, including before the instant inventors even came into possession of the membranes themselves (i.e. applicant appears to have bought its dry membranes commercially and did not manufacture it themselves). Applicant has never disclosed that (as an example) du Pont never exposed its membranes to moisture before drying it and selling it as a dry sheet. Hence, applicant does not appear to be in a position to state that the membrane has *never* been exposed to moisture since its inception. Although applicant did state in paragraph 0009 that the dry ionomer membranes "do not include membrane that have been soaked in any solution such as water, or acidic solution", it would appear to the examiner that this is referring to the membranes during the construction of sensor and not the entire existence of the membrane (as evidenced by applicant subsequently wetting this "dry" membrane (see cancelled claim 22)). Furthermore, it is unclear how a membrane can be without moisture exposure during its entire existence. Polymers are typically polymerized in an organic solvent in violation of the new limitation. Moreover, many membranes are made by dissolving the polymerized product in an organic solvent, casting the membrane and thereby drying that also in violation of the new limitation. Even rinsing the membrane clean after synthesis would violate this new claim language. The Encyclopedia of Polymer Science and Engineering teaches that Nafion is typically synthesized in its sodium form (see pp. 398-399). However, "Nafion 117" as sold is in its acidic form (see Aldrich listing). This indicates that Nafion 117 has already been ion-exchanged, presumably by exposure to a suitable electrolyte (i.e. moisture). This would be in violation of the new claim language. How does one make a membrane without *ever* exposing the membrane to moisture? Clarification is requested.

Claim Rejections - 35 USC § 103

6. Claims 20-22 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 1 037 041 A2 in view of any one or more of Lawrance et al (USP 4,272,353) or Debe et al (USP 6,319,293).

7. EP '041 discloses a method for making a sensor that comprises the steps of providing a substrate 21, placing at least one opening 22 in the substrate, placing an electrode (23, 24, 28) proximate to the at least one opening and contacting a ionomer membrane 25 to the substrate and electrode. See fig. 4 and paragraphs 0031 through 0033. With respect to the ionomer membrane being "dry", EP '041 never specifies whether the membrane is wet or dry during the hot pressing stage of sensor construction. However, numerous references teach that the membrane can be "dry" during electrochemical cell construction. Lawrance teaches that keeping the membrane dry during sensor construction allows the membrane to be roughened providing greater adhesion and catalytic activity for the sensor. See col. 11, l. 62 through col. 12, line 48. Debe also teaches that the membrane should be dried prior to construction of an electrode-membrane assembly. See col. 16, ll. 50-61 and col. 31, ll. 17-31. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of Lawrance and/or Debe and utilize a dry form of membrane during the contacting step of EP '041 because the use of a dry membrane obviates the prior art repeatedly recognized the use of the dry form of the membrane.

8. Moreover, Lawrance teaches that conventional hot-pressing (i.e. the technique utilized by EP '041) utilizes temperature of 182-188 °C (see col. 12, ll. 33-35), which greatly exceeds the

boiling temperature of water. Hence this indicates that in order for one to hot-press a membrane to a substrate surface, one would have had to apply enough heat to dry the membrane first because thermodynamically the membrane could not get to those temperatures until the water was driven from the membrane anyway. In view of this, one possessing ordinary skill in the art would have recognized that a dry form of the membrane would have been preferable for hot-pressing because the hot-pressing stage would have occurred more quickly with less heat application for an already dried membrane over a wet membrane. Moreover, even if a "wet" membrane were utilized for the hot-pressing step, as discussed above the membrane would have been dried during that hot-pressing stage anyways and would still have met the claim requirement that the membrane be "dry" during the contacting step.

9. With respect to aligning the electrode with a gas passage, see fig. 4.

10. EP '041 further discloses a counter electrode (4, 14, 24) and a reference electrode 28. See paragraph 0048 as an example. With respect to wetting the membrane, applicant does not appear to positively recite a step of wetting the membrane (however, see discussion below).

11. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over EP '041 in view of any one or more of Lawrance or Debe as applied to claim 20 above and in further view of LaConti et al (USP 4,820,386).

12. The references set forth all the limitations of the claim and EP '041 further disclosed the presence of a layer (2 or 22) for slowing inputs of gas moving through the at least one opening. However, EP '041 did not explicitly disclose that said layer could be a polymer. LaConti teaches this layer can comprise polymers. See col. 3, ll. 62-65; col. 5, ll. 49-58 and col. 6, ll. 59-68. It would have been obvious to one of ordinary skill in the art at the time the invention was being

made to utilize the teaching of LaConti for the method of EP '041 and Lawrance or Debe because the substitution of one known diffusion material for another requires only routine skill in the art.

13. Claims 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP '041 and either Lawrence or Debe as applied to claim 20 above, and further in view of Shen et al (USP 5,650,054).

14. The references set forth all the limitations of the claims, but did not explicitly recite the presence of a reservoir. However, Shen discloses utilizing a reservoir to ensure that the membrane remains hydrated regardless of the humidity level of the air. See col. 7, ll. 50-61. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to add the reservoir of Shen to manufacturing of EP '041 in view of Lawrance or Debe in order to manufacture a sensor that provides consistent response regardless of humidity level of the measured gas.

15. Claims 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP '041 in view of any one or more of Lawrance or Debe with evidence from, or in further view of, Beech et al (Carbon Monoxide Sensors, Electrochemistry at Loughborough, pp. 1-4, 1999).

16. These claims differ from claim 20 in specifying the presence of a hole in the dry ionomer membrane. However, this broadly defined "hole" would read on any pores that might by present in the ionomer membrane itself. Beech evidences that Nafion inherently has gas permeability and water diffusion properties. See p. 2. In order for Nafion to provide gas permeability and water diffusion, Nafion must possess some degree of porosity and this degree of porosity would read on the claimed "hole" giving the claim language its broadest reasonable interpretation.

17. Alternatively, even if all forms of Nafion are not gas permeable and water diffusible and Beech cannot be utilized to evidence that the particular Nafion of EP '041 was gas permeable and water diffusible, Beech is drawn to a gas sensor and teaches that gas permeability and water diffusion properties of the Nafion desired for its sensor. Presumably, these properties are desired because a hydrated Nafion has an improved sensor response (see discussion of Shen above) and the permeability would improve the sensitivity and response time of the sensor. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Beech for the method of EP '041 in view of Lawrance or Debe in order to improve the sensitivity, sensor response and response times for the sensor.

18. Claims 20-22 and 24-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Prohaska et al (USP 6,682,638) in view of any one or more of Lawrance or Debe.

19. The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the

reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

20. Prohaska is drawn to substantially the same sensor as set forth by the instant invention. In particular, Prohaska discloses placing hole 20 through both the substrate 10 and the ionomer membrane 5, placing a number of electrodes (3, 7, 8) in proximity to the hole, and teaches the presence of a reservoir 9 for hydrating the sensor. See fig. 1 and col. 2, l. 66 through col. 3, l. 42. Prohaska differs from the claims of the instant invention by specifying that the ionomer membrane is dry during the contacting step of manufacture. However, numerous references teach that the membrane can be "dry" during electrochemical cell construction. Lawrance teaches that keeping the membrane dry during sensor construction allows the membrane to be roughened providing greater adhesion and catalytic activity for the sensor. See col. 11, l. 62 through col. 12, line 48. Debe also teaches that the membrane should be dried prior to construction of an electrode-membrane assembly. See col. 16, ll. 50-61 and col. 31, ll. 17-31. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of any of Lawrance or Debe and utilize a dry form of membrane during the contacting step of Prohashka because the prior art repeatedly recognized the use of the dry form of the membrane.

21. Moreover, Prohaska suggests the use of "heat" for its contacting step (see col. 7, ll. 23-25). Lawrance teaches that hot-pressing (i.e. a conventional technique for attaching an ionomer membrane to other substrates via heat (see EP '041 and Lawrance)) utilizes temperature of 182-188 °C (see col. 12, ll. 33-35), which greatly exceeds the boiling temperature of water. Hence this indicates that in order for one to hot-press a membrane to a substrate surface, one would

have had to apply enough heat to dry the membrane first because thermodynamically the membrane could not get to those temperatures until the water was driven from the membrane anyway. In view of this, one possessing ordinary skill in the art would have recognized that a dry form of the membrane would have been preferable for hot-pressing because the hot-pressing stage would have occurred more quickly with less heat application for an already dried membrane over a wet membrane.

22. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Prohaska in view of any one or more of Lawrance or Debe as applied to claim 20 above and in further view of LaConti.

23. This claim differs by setting forth the use of a polymer layer over the electrode. This claim is rendered obvious in view of LaConti for the same reasons given above.

Response to Arguments

24. Applicant's arguments filed 6-16-2005 have been fully considered but are only partially persuasive. In particular, the examiner has withdrawn the use of Shen, Fray and Surampudi because these references all specify a step of exposing the ionomer membrane to moisture prior to the sensor construction in apparent violation of the amended claims (however, see 112 rejections above). However, the examiner was not persuaded by the arguments concerning Lawrance or Debe.

25. With respect to Lawrance, applicant urges that they eventually soak the membrane as well (see col. 12, ll. 1-50). However, this soaking occurs after the membrane and electrode assembly was constructed. See col. 12, ll. 41-49. Soaking the membrane/electrode combination

after it has been formed is something the instant invention even teaches doing. See cancelled claim 22. Claims 20 and 31 have been interpreted as specifying that the membrane is dry while it is being assembled to the electrode and was dry before being attached to the electrodes, but not required to be dry for periods following the claimed electrode membrane construction. Hence, the process of Lawrance still reads on the use of a dry membrane because Lawrance doesn't wet the membrane until after the electrode and membrane have been constructed, like the instant invention teaches.

26. With respect to Debe, applicant refers to col. 22, l. 65 through col. 23, l. 12 where the membrane is soaked in solution prior to being air dried. Although the applicant is correct with respect to that passage, col. 25, ll. 20-25 of Debe states that this whole solvent pretreatment can be dispensed with if so desired. Hence, Debe still reads on the new claim language as near as the examiner can ascertain (again, see 112 rejections above).

Conclusion

27. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kaj Olsen whose telephone number is (571) 272-1344. The examiner can normally be reached on Monday through Thursday from 5:30 A.M. to 3:00 P.M. and on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen, can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AU 1753
August 25, 2005

KAJ K. OLSEN
PRIMARY EXAMINER